Community Intervention Trial for Smoking Cessation (COMMIT): II. Changes in Adult Cigarette Smoking Prevalence

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ABSTRACT

Objectives. COMMIT (Community Intervention Trial for Smoking Cessation) investigated whether a community-level multichannel intervention would decrease the prevalence of adult cigarette smoking and increase quitting, with heavy smokers (≥25 cigarettes per day) receiving the highest priority.

Methods. One community within each of 11 matched community pairs (10 in the United States, 1 in Canada) was randomly assigned to intervention. Baseline (1988) and final (1993) telephone surveys sampled households to determine prevalence of smoking behavior.

Results. Among the target population aged 25 to 64 years, there was no intervention effect on heavy smoking prevalence, which decreased by 2.9 percentage points in both intervention and comparison communities. Overall smoking prevalence decreased by 3.5 in intervention communities vs 3.2 in comparison communities, a difference not statistically significant, while the mean quit ratios were 0.198 versus 0.185, respectively, a difference of 0.013 (90% test-based confidence interval = −0.003, 0.028).

Conclusions. Results are consistent with the cohort analysis reported separately, although the more powerful cohort design showed a statistically significant intervention effect upon light-to-moderate smokers. This community-based intervention did not have a significant impact on smoking prevalence beyond the favorable secular trends. In future efforts, additional strategies should be incorporated and rigorously evaluated. (*Am J Public Health.* 1995;85:193–200)

Introduction

The Community Intervention Trial for Smoking Cessation (COMMIT), funded by the National Cancer Institute (NCI), was designed to test the effectiveness of a multifaceted, 4-year community-based intervention to help smokers achieve and maintain cessation.[1,2] Highest priority was placed on affecting heavy smokers, although it was assumed that in the process of reaching this group, light-to-moderate smokers would also be affected. Within each of 11 matched community pairs (10 in the United States, 1 in Canada), one community was randomly assigned to intervention and the other served as comparison.

The effects of the COMMIT intervention on smoking cessation rates among cohorts of heavy smokers and light-to-moderate smokers are reported separately.[3] In the design of COMMIT, the selection of cohort quit rates as the primary outcome was based on the higher statistical power associated with analyzing cohorts of smokers and on the possibility that migration patterns may affect smoking prevalence differentially in the paired communities.[2] However, the examination of changes in smoking prevalence was also deemed important for assessing the impact of the COMMIT intervention on overall smoking behavior. Prevalence is influenced by both initiation and cessation of smoking.

This paper reports the effects of the COMMIT intervention on adult cigarette smoking behavior based on a comparison of pre- and postintervention cross-sectional surveys carried out in the 22 COMMIT communities. It also examines the consistency of these prevalence change estimates obtained from cross-sectional surveys with quit rates estimated from the previous cohort analysis.[3]

Methods and Materials

The design and intervention of COMMIT have been described previously[1,2,4] and are summarized very briefly here. Because the COMMIT intervention was community based, the community was chosen as the unit of randomization. COMMIT involved 11 participating research institutions, each working with a matched pair of communities. The two communities within each pair were matched for geographic location (state or province), size, and general sociodemographic factors. Details of the community selection have been reported previously.[1] According to data from the 1990 Census (1991 in Canada), the community populations varied from 49 421 to 251 208 residents.

From January to May 1988, a telephone survey was conducted to estimate baseline prevalence and identify cohorts of smokers within each community. Then in May, one community within each of the 11 matched pairs was randomly assigned to receive the COMMIT intervention, which began shortly after with mobilization of the communities.[1] Specific intervention activities took place from January 1989 through December 1992. A second (final) prevalence survey was conducted from August 1993 to January 1994.

*See Appendix B to Part I of this paper for a complete listing of members.

Sylvan B. Green, MD, assumes full responsibility for the content and integrity of the paper.

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The telephone surveys were centrally conducted by independent contractors. The surveys were identified as being sponsored by the US Public Health Service or, in Canada, by the University of Waterloo and McMaster University, but none was linked to local COMMIT activities.

COMMIT was a partnership among the 11 research institutions, the corresponding local communities, a coordinating center responsible for data management, NCI program staff, and NCI biostatisticians. Intervention activities were defined so they could be carried out by community volunteers or local staff or agencies with limited external resources. Intervention focused on four primary channels: public education through the media and communitywide events; health care providers; work-sites and other organizations; and cessation resources.[1,3,5,6]

Baseline Prevalence Survey

A modified random-digit-dialing method and geographic boundary screening were used for the baseline prevalence survey to obtain representative samples of approximately 5400 households within each of the 22 communities. A sample of this size was chosen to obtain the required number of heavy smokers to form the cohorts.[1,2] The cross-sectional analyses reported here are based on data from the random half of the sample (approximately 2800 households per community) that was surveyed at baseline by the same independent contractor who also performed the entire final prevalence survey. Use of data collected by the same contractor for both surveys enhances comparability of the initial and final prevalence estimates used to calculate changes in prevalence.

The sample of telephone numbers was obtained from all numbers (both listed and unlisted) whose exchange prefixes covered the COMMIT study areas. Certain area code–exchange prefix combinations known not to include any households were excluded. The A.C. Nielsen Total Telephone Frame was used for telephone numbers in the United States; telephone numbers in Canada were selected by the Institute of Survey Research at York University. COMMIT used a disproportionate stratified random-digit-dial sampling design, with two strata per community. This type of design uses stratification based on how likely a telephone number is to be attached to a household, and it allocates the sample disproportionately among the strata to decrease cost.

Baseline survey data were collected in two stages. The first stage was a proxy (screener) interview. The sample of telephone numbers was screened to identify households within the site geographical boundaries and to roster age-eligible persons within such households. In each household, an individual 18 years of age or older, serving as proxy, was asked to identify and list the age, sex, and smoking status of all individuals 18 years of age or older in the household. Depending on their smoking status, all eligible individuals in the household were considered for the second stage, an extended interview (self-report). Current smokers aged 25 to 64 years and a quota sample of recent ex-smokers (those who reported stopping within the past 5 years) were interviewed to assess smoking behavior, desire to quit smoking, past quit attempts, methods used in trying to quit, and sociodemographic information. Callbacks were performed as necessary to reach these individuals.

Final Prevalence Survey

The sampling methods used for the final prevalence survey were analogous to those in the baseline survey, including again a disproportionate stratified random-digit-dial design to sample households. Within each sampled household (approximately 2300 households per community in the final survey), all persons 18 years of age and older were rostered by a proxy who provided information on their age, sex, and smoking status. Current smokers, smokers who had stopped within the past 8 years, and a random sample of longer term ex-smokers and never smokers aged 25 to 64 years participated in an extended interview to gather information on smoking status; those confirmed as current smokers or recent ex-smokers (who stopped within the past 5 years) were interviewed further about smoking behavior, methods used in trying to quit, and sociodemographic information. In addition, subsamples of participants in the extended interview, stratified by smoking status, were asked a set of questions to assess their attitudes about smoking as well as their intervention program awareness and participation. These questions were asked after smoking status was ascertained; thus, there was no possibility that asking these questions could affect estimates of smoking behavior. These questions also estimated awareness of and participation in tobacco control activities for comparison communities.

Measurement of Cigarette Smoking Behavior

This paper evaluates the effect of the COMMIT intervention on changes in five measures of communitywide adult cigarette smoking behavior, defined as follows:

1. *Change in overall cigarette smoking prevalence for those aged 18 years and older.* In both the baseline and final surveys, each proxy was asked to roster all adults (ages 18+) in the household and to indicate for every person whether they had smoked at least 100 cigarettes during their lifetime and whether they currently smoked. Cigarette smoking prevalence was estimated as the percentage of adults who were identified as current smokers. The actual prevalence estimates used in this analysis were based on a weighting procedure that accounted for the survey design; this procedure is described below under Statistical Analysis.

2. *Change in overall cigarette smoking prevalence for those aged 25 to 64 years.* Because the cohort analysis[3] was limited to individuals between 25 and 64 years of age, smoking prevalences for this age group were calculated separately for purposes of comparison.

3. *Change in the prevalence of heavy smoking for those aged 25 to 64 years.* Because of COMMIT's emphasis on measuring the effect of the intervention on heavy smoking, this outcome was analyzed separately. In both the baseline and final surveys, the prevalence of heavy smoking was based on the fraction of current smokers who self-reported smoking 25 or more cigarettes per day (either per weekday or per weekend day). Information on the amount smoked was obtained from self-report rather than from proxy and was collected only on respondents to the extended interview (i.e., those aged 25 to 64). Within each community, the fraction of heavy smokers among total smokers in the extended interview was applied to the proxy-estimated overall smoking prevalence for this age group to obtain estimates of heavy smoking prevalence.

4. *Quit ratio among those aged 25 to 64 years.* The quit ratio was defined, using data in the final prevalence survey, as the number of "recent quitters" divided by the number of current smokers plus "recent ex-smokers." Ex-smokers were adults self-reported as having smoked at least 100 cigarettes in their lifetime but not smoking currently; ex-smokers were subdivided into those who reported hav-

ing stopped smoking within 5 years of the extended interview (recent) and those who reported having stopped smoking more than 5 years before the interview (long term). Recent quitters were defined as those recent ex-smokers who reported not smoking any cigarettes during the preceding 6 months. This definition excludes those who had stopped smoking less than 6 months ago and so is analogous to the definition of cohort quit rate.[3] Quit ratios reported here are based on recent quitters (within 5 years) so as to investigate the effects of the COMMIT intervention, which occurred during that time period.

5. *Change in per capita cigarette use among those aged 25 to 64 years, based on self-reports.* Per capita cigarette use was defined as the average per-person daily consumption of cigarettes for all smokers and nonsmokers in the population aged 25 to 64. In both the baseline and final surveys, current smokers were asked to provide estimates of daily cigarette consumption separately for weekdays and weekends, and these reported estimates were combined into a daily mean. Per capita use was determined by computing the mean number of cigarettes smoked per day by current smokers, as reported in the extended interview, and multiplying it by the smoking prevalence obtained from the proxy interview.

Measurement of Perceived Receipt of Smoking Control Activities

For smokers and recent ex-smokers in the final survey, this paper also evaluates responses to questions directed at awareness of and participation in smoking control activities during the period of the COMMIT intervention. Eight "receipt indices" and an overall measure (obtained by standardizing and summing the eight separate indices) were calculated as in the cohort analysis.[3]

Statistical Analysis

For each outcome variable, estimates were obtained separately by survey and by community. Each person in the screener (proxy) enumeration was assigned a sampling weight to account for both the sampling design and nonresponse. The weights were derived as a function of the probability associated with selection of blocks of telephone numbers, the number of telephones in the household as determined at the time of contact, and a telephone exchange–specific response rate computed after each survey was completed. Measures obtained from the extended interview (heavy smoking prevalence, quit ratio, per capita cigarette use, intervention receipt indices) were standardized to the proxy prevalence estimates for relevant subgroups (heavy smokers, recent quitters, etc.) to adjust for subsampling and nonresponse in the extended interview.

Resulting estimates, stratified by age and sex, were standardized to community-specific age and sex distributions from the 1990 Census (1991 in Canada). Because this census occurred approximately midway between the baseline and final surveys, it was chosen to standardize results from both surveys. This procedure was equivalent to a "direct standardization" to census distributions within each community.[7] It adjusted for changes in age-sex distributions between baseline and final surveys as well as for differential age- and sex-specific nonresponse rates, which, for example, could be caused by differential refusal rates or by differential telephone coverage rates that may be age and sex dependent.

Standard errors for community-specific estimates of smoking prevalence were generated by the *SUDAAN: Professional Software for Survey Data Analysis,*[8] a computer software package for analyzing complex survey designs.

For the three measures of smoking prevalence and for per capita cigarette use, changes from baseline to final survey were determined for each of the 22 communities. Quit ratio and receipt indices for each community were obtained from the final survey. Differences between the intervention and comparison community of each pair were calculated for each outcome. Significance testing was done using a permutation test[9] accounting for the fact that communities (rather than individuals) were randomized and that this randomization was performed within community pairs; this methodology is described in the cohort analyses.[3] Correlations between outcome measures across communities (or across community pairs) were investigated using Spearman rank correlations.

Results

COMMIT was a randomized trial with a sample size of 11 matched pairs of communities. In tables of results, these pairs are listed in arbitrary order and labeled 1 through 11; the order is the same across all tables (both here and for the cohort analyses[3]). The individual communities, however, are not identified.

The initial comparability of community pairs in COMMIT has been previously examined.[1,10] At baseline, community pairs were well matched on a variety of sociodemographic variables, tobacco use measures, and other potentially important community factors such as the number of physicians, work-sites, stop-smoking programs, and media outlets.

Baseline and Final Survey Response Rates

Table 1 shows the response rates for each community for the proxy interview (household rostering) in the baseline and final surveys. The mean survey response rate for the 11 intervention communities for the proxy interview at baseline was 82.8%; the mean for the 11 comparison communities was 82.6%, a negligible and nonsignificant difference. For the final survey, the mean survey response rate for intervention communities was 72.0%; the mean for the comparison communities was 72.8%, also a nonsignificant difference. The overall response rate was about 10 percentage points lower for the final survey than for the baseline survey, owing almost entirely to an increase in interview refusals. It is not clear why interview refusals were greater in the final survey; however, response rates were generally similar within matched pairs.

The age and sex characteristics of individuals enumerated in each of the two surveys were compared against population characteristics from census data. Compared with the census, the baseline survey generally underrepresented both men and women over age 65 and overrepresented women under age 40. The final survey underrepresented men and women over age 60 while overrepresenting men and women aged 40 to 54. Such disparities were taken into account in the age-sex standardization that was used for the various outcome measures.

The proxy method for determining current smoking status has been used in many national probability sample surveys, including the National Health Interview Survey, the Current Population Survey, and the Adult Use of Tobacco Surveys. Proxy indication of current smoking status has been shown to be very reliable.[11–13] In the baseline survey, 97.2% of individuals aged 25 to 64 who were identified during the household screener interview as current smokers and were subsequently administered the extended interview (which

TABLE 1—Survey Response Rates (*r*) for Proxy Interviews and Number (n) of Eligible Proxy Interviews Obtained, by Intervention and Comparison Communities

	Baseline (1988) Survey					Final (1993) Survey				
	Intervention		Comparison			Intervention		Comparison		
Pair	n	*r*	n	*r*	Response Rate Difference	n	*r*	n	*r*	Response Rate Difference
1	2937	80.5	2907	82.4	−1.9	2146	68.2	2288	70.8	−2.6
2	1713	83.4	1619	80.3	3.1	2071	73.4	2241	73.3	0.1
3	2172	82.9	2258	83.6	−0.7	2335	73.7	2311	75.1	−1.4
4	2006	80.8	2034	75.1	5.7	2360	70.7	2216	67.6	3.1
5	3016	79.8	2782	78.7	1.1	2330	69.7	2334	64.2	5.4
6	4894	83.2	4265	89.2	−6.0	2197	69.7	2461	80.4	−10.7
7	2601	78.5	3107	74.9	3.6	2220	70.9	2235	66.9	4.0
8	2367	85.0	2327	82.6	2.4	2450	71.5	2547	73.2	−1.8
9	3106	84.4	2499	85.6	−1.3	2262	78.0	2378	76.6	1.5
10	3338	86.8	3472	89.3	−2.5	2357	73.2	2371	77.0	−3.8
11	3993	85.0	2076	86.7	−1.7	2378	72.5	2323	76.1	−3.6
Community means	2922	82.8	2668	82.6	0.2*	2282	72.0	2337	72.8	−0.9**

*P (two-sided) = .88; **P (two-sided) = .56.

TABLE 2—Changes in Cigarette Smoking Behavior, by Intervention Condition

Outcome Measure	Community Means: Intervention	Community Means: Comparison	Difference	P (One-Sided)	90% Confidence Interval
Smoking prevalence among ages 18+					
Baseline (1988)	24.6	25.1	−0.6		
Final (1993)	21.6	22.5	−0.8		
Change (1988–1993)	2.9	2.7	0.3	.31	−0.7, 1.3
Smoking prevalence among ages 25 to 64					
Baseline (1988)	27.6	28.6	−1.0		
Final (1993)	24.1	25.4	−1.3		
Change (1988–1993)	3.5	3.2	0.3	.36	−1.2, 1.8
Heavy smoking prevalence among ages 25 to 64					
Baseline (1988)	10.2	11.0	−0.9		
Final (1993)	7.3	8.2	−0.9		
Change (1988–1993)	2.9	2.9	−0.0	.51	−0.7, 0.7
Quit ratio among ages 25 to 64: final	0.198	0.185	0.013	.09	−0.003, 0.028
Per capita daily cigarette use among ages 25 to 64					
Baseline (1988)	5.64	6.02	−0.38		
Final (1993)	4.45	4.89	−0.44		
Change (1988–1993)	1.19	1.13	0.06	.37	−0.27, 0.38

included a self-report of current smoking status) confirmed the information obtained from the proxy. Similarly, the agreement between proxy and self-report for current smoking status at the final survey was 97.6% and that for ex-smoking status at the final prevalence survey was 95.5%.

For the extended interview at baseline, the community mean completion rate for smokers was 85.7% for intervention communities and 85.5% for comparison communities, a nonsignificant difference. For the final survey, the community mean completion rate for all individuals selected for extended interview was 80.1% for intervention communities and 81.2% for comparison communities, also a nonsignificant difference.

Changes in Cigarette Smoking Behavior

Table 2 shows changes in the various measures of cigarette smoking behavior from the baseline (1988) to the final survey (1993) for intervention versus comparison communities. The quit ratio is provided only for the final survey because, by definition, it measures behavioral change over the 5-year period. The mean quit ratio was 0.198 for the intervention communities compared with 0.185 for the comparison communities, showing an additional 1.3% of smokers in the intervention communities who reported having quit in the last 5 years (one-sided $P = .09$ by permutation test; 90% confidence interval (CI) = –0.3%, 2.8%). Each of the other four measures showed smoking behavior declining between 1988 and 1993, but none of these changes differed significantly between the intervention and comparison communities. Specifically, smoking prevalence for those aged 25 to 64 showed a mean decrease of 3.5 percentage points for intervention communities and of 3.2 percentage points for comparison communities, an intervention effect of 0.3 that was not statistically significant ($P = .36$). The prevalence of heavy smoking showed a mean decrease of 2.9 percentage points for both the intervention and comparison communities. Per capita daily cigarette use decreased by a mean of 1.19 in intervention communities versus 1.13 in comparison communities ($P = .37$ for intervention effect).

Community-specific estimates are shown in Table 3 for cigarette smoking prevalence among those aged 25 to 64. As might be expected, there was considerable variability across communities, but all 22 communities showed a decrease in smoking prevalence among this age group during this time period. Similarly, 21 of 22 communities showed a decrease in smoking prevalence among those aged 18 and over; the remaining comparison community had a very small increase (data not shown).

TABLE 3—Results by Community for Cigarette Smoking Prevalence among Those Aged 25 to 64, Expressed as Percentage Smoking

Pair	Intervention Final 1993	Intervention (SE)[a]	Intervention Change 1988–1993	Comparison Final 1993	Comparison (SE)[a]	Comparison Change 1988–1993	Difference[b]
1	21.6	(0.76)	7.0	22.2	(0.75)	4.8	2.3
2	33.8	(0.91)	1.0	27.8	(1.02)	4.8	−3.8
3	24.8	(0.80)	0.7	26.4	(0.80)	2.2	−1.5
4	25.0	(0.84)	5.0	30.0	(0.87)	3.6	1.4
5	24.0	(0.77)	6.2	30.6	(0.92)	2.0	4.2
6	19.3	(0.73)	4.2	18.3	(0.72)	4.0	0.2
7	25.3	(0.82)	2.4	22.2	(0.79)	5.7	−3.3
8	29.3	(0.84)	2.1	28.3	(0.90)	2.3	−0.2
9	20.5	(0.79)	4.4	27.9	(0.85)	0.6	3.8
10	22.0	(0.87)	2.0	18.8	(0.82)	4.2	−2.2
11	19.9	(0.76)	3.5	27.1	(0.94)	1.4	2.1
Community means	24.1		3.5	25.4		3.2	0.3

[a]SE = standard error of final (1993) prevalence.
[b]Differences in prevalence change (1988–1993) between intervention and comparison communities.

TABLE 4—Differences in Receipt Indices for Smokers and Recent Ex-Smokers, from the Final Survey, by Intervention Condition

Index (Allowable Minimum-Maximum Values)	Community Means: Intervention	Community Means: Comparison	Difference	*P* (One-Sided)
Cessation resources (0–6)	0.535	0.509	0.026	.09
Health care (0–6)	1.313	1.243	0.070	.08
Work-sites (0–7)	1.681	1.655	0.026	.33
Media/public education (0–16)	5.938	6.021	−0.083	.68
Religious organizations (0–10)	2.643	2.679	−0.036	.57
Programs and materials (0–10)	4.274	4.028	0.245	.05
Events and contests (0–10)	3.049	2.550	0.500	<.01
Smoking unacceptability (0–10)	4.869	4.824	0.045	.40
Summary (standardized)	0.393	0.003	0.390	.02

Intervention Receipt Indices

Table 4 shows intervention receipt indices from the final survey, computed for smokers and recent ex-smokers. Larger values of an index correspond to greater awareness and/or participation. All but two indices showed a difference in favor of the intervention communities although some of these differences were not statistically significant. The two greatest differences were in awareness of an increase in events and contests and in smoking cessation programs and materials in the community. Importantly, the summary measure was significantly greater in the intervention communities than in the comparison communities ($P = .02$). Differences in the summary receipt index between intervention and comparison communities were correlated significantly with differences in the quit ratio (rank correlation 0.67, $P = .02$), but this was not so with differences in prevalence change (rank correlation 0.02, $P = .96$). More details of receipt indices are planned for a future paper. (A list of survey questions contributing to specific receipt indices is available from the authors.)

Relationships among Cohort and Cross-Sectional Measures

To investigate relationships among primary COMMIT outcome measures, we determined correlations for three measures of change in smoking behavior in each of the 22 communities—changes in cigarette smoking prevalence between the baseline and final surveys, quit ratios from the final survey, and estimates of the overall quit rate from the cohorts[3] of smokers tracked in each community—all for those aged 25 to 64 years. There was a modest correlation between the two measures derived from the cross-sectional analysis: changes in smoking prevalence and quit ratios (rank correlation 0.37, $P = .09$). Of these two measures, one might have expected quit ratios to show the higher correlation with overall cohort quit rates. However, cohort quit rates had little correlation with quit ratios (rank correlation 0.19, $P = .40$) but were correlated with prevalence changes (rank correlation = 0.46, $P = .03$). Interestingly, quit ratios were correlated inversely with baseline prevalences (rank correlation −0.62, $P = .002$) so that larger quit ratios were associated with lower initial prevalences. However, little correlation with baseline prevalence was observed for either prevalence changes or cohort quit rates.

Correlations were also determined for differences between intervention and comparison communities across the 11 pairs for each of these three measures; with this sample size, none of these correlations was statistically significant. Differences in smoking prevalence change had a rank correlation of 0.41 ($P = .21$) with differences in quit ratio, while differences in overall cohort quit rate had rank correlations of 0.26 ($P = .45$) with differences in quit ratio and of only 0.03 ($P = .94$) with differences in prevalence change.

Relationship of Prevalence Changes to Demographic Factors

Changes in cigarette smoking prevalences between the baseline and final surveys across all 22 communities were examined separately by age and sex (Table 5) for descriptive purposes only. Absolute smoking prevalences were higher for men than for women; however, men and women showed similar decreases in smoking prevalence. Prevalence decreases

TABLE 5—Changes in Cigarette Smoking Prevalence, by Age and Sex, All Communities Combined

Factor/Category	Baseline, % (1988)	Final, % (1993)	Absolute Change (1988–1993)	Relative Percent Change
Age, y				
18–24	23.9	23.2	0.7	2.8%
25–44	28.5	26.4	2.1	7.4%
45–64	27.6	21.9	5.7	20.5%
65+	13.9	11.2	2.7	19.4%
Sex				
Female	23.1	20.1	3.1	13.2%
Male	26.8	24.3	2.5	9.4%

were smaller below age 45 than for the older age groups; the youngest age group (18 to 24 years) had a much smaller prevalence decrease than the others. Although cigarette smoking prevalence was lowest for those aged 65 and over, the relative percentage change (19%) for this group was very similar to that for the group aged 45 to 64 (21%), which had a considerably greater absolute prevalence. Separate analyses showed no evidence of a statistical interaction between the intervention effect and age or sex.

Discussion

This paper reports the effects of the COMMIT intervention on changes in cigarette smoking behavior derived from pre- and postintervention cross-sectional surveys carried out in the 22 COMMIT communities. While each of the five examined measures of smoking behavior showed declines from baseline to final surveys, the amount of change was similar between the intervention and comparison communities (with a slightly higher mean quit ratio in intervention communities). Averaged across the 22 communities, cigarette smoking prevalence in adults aged 18 and over decreased from an estimated 24.9% in 1988 to 22.1% in 1993. This rate of decline is consistent with results from national surveys conducted during the same period.[14–19]

The effects of the COMMIT intervention on quit rates for cohorts of smokers aged 25 to 64 followed over the 5 years of this trial have been reported separately.[3] "Quit rate" was defined as the fraction of cohort members who had achieved and maintained cessation for at least 6 months at the end of the trial. For heavy smokers, the mean quit rates for the intervention and comparison communities were nearly identical. There was, however, a statistically significant mean intervention effect (one-sided $P = .004$) for light-to-moderate smokers, with an additional 3% of these smokers quitting in the intervention communities. Overall, the mean combined quit rate was 26.5% for the intervention communities and 24.7% for the comparison communities, a statistically significant difference of 1.8 percentage points ($P = .031$; 90% CI = 0.2, 3.4).

The results presented in this paper are consistent with the previous cohort analysis. The mean quit ratio for those aged 25 to 64 at final survey was 0.198 for the intervention communities and 0.185 for the comparison communities, showing that an additional 1.3% of smokers in the intervention communities reported having quit ($P = .09$; 90% CI = −0.3%, 2.8%). This effect is similar to the difference of 1.8 percentage points seen in overall cohort quit rates. Among those aged 25 to 64, there was no intervention effect on heavy smoking prevalence, which decreased by a mean of 2.9 percentage points both in the intervention and comparison communities. Overall smoking prevalence for this age group decreased by 3.5 in the intervention communities versus 3.2 in the comparison communities, a difference of 0.3 which was not statistically significant (90% CI = −1.2, 1.8). However, if the mean overall quit rates from the cohorts are applied to the mean baseline prevalences, the prevalence changes so calculated would be 7.31 and 7.06 for the intervention and comparison communities, respectively, a difference of 0.25 percentage points that is consistent with the observed difference.

In the design of COMMIT, it was recognized that measures of behavioral change in smoking derived from repeated cross-sectional surveys would be subject to much greater sampling variability than estimates of behavioral change obtained from following cohorts of smokers.[2] Also, because of in-migration, analysis of behavioral change based on cross-sectional surveys might include persons who experienced less exposure to the COMMIT intervention, thus making it more difficult to detect an intervention effect.

Others have compared cohort and prevalence survey designs for evaluating community interventions.[20–22] It has been suggested that the possibility of bias introduced by cohort attrition and the efforts required to minimize that attrition may outweigh the increased precision that can be obtained by a cohort design.[22] In COMMIT, the cohort results were consistent with the prevalence results. However, the increased precision in the cohort design, along with the sample size of 11 matched pairs of communities, enabled the identification of real but small reductions in smoking; these would not have been identified as statistically significant had we relied solely on prevalence surveys. The greater statistical power of the cohort evaluation arose particularly because COMMIT cohorts were restricted to current smokers. The observed superiority of cohort over cross-sectional evaluations in this trial will not necessarily extrapolate to all community trials.

The age-sex standardization used in these analyses was based on community-specific census counts. An alternative approach could have used a common age-sex distribution for both communities of a pair (such as their combined distribution). This would have provided estimates of prevalence differences that were adjusted for differences in age-sex distribution between communities (i.e., the usual epidemiological meaning of direct standardization). Additional analyses of prevalence changes done in this manner gave results quite similar to the results with community-specific standardization, so only the latter are reported.

Changes in smoking prevalence were similar for men and women but differed by age, with a greater decrease in prevalence of smoking above age 44 and the smallest decrease among those aged 18 to 24. In the analysis of cohort quit rates in COMMIT, age was a strong and significant predictor of cessation.[3] Previous studies have shown that older smokers who try to quit are more likely to succeed than younger smokers.[23] Furthermore, changes in cigarette smoking prevalence are influenced not only by quitting behavior but also by initiation of smoking. Most smokers begin smoking before age 20, and

recent national surveys indicate that smoking initiation rates may be increasing slightly among teenagers and young adults.[24] Thus, the relatively small amount of change in smoking prevalence seen in COMMIT in the youngest age group may indicate that whatever cessation occurred in this age group was offset by a nearly equal level of smoking initiation.

One possible explanation for the limited effect of the COMMIT intervention is that the duration may have been too short to have measurable impact on population-based indicators of smoking behavior. For example, the long-term intervention study in North Karelia, Finland, failed to observe differences in smoking behavior in the first 5 years of intervention; after 10 years, however, smoking prevalence among men had declined more in the intervention county than in the comparison county.[25,26]

It is also possible that the intervention was not sufficiently intensive. The intervention receipt indices provide an objective measure of the perceived level of smoking control activity in the intervention and comparison communities. Differences in these receipt indices measured in the final survey showed that persons in the intervention communities were more likely than those in the comparison communities to recall exposure to smoking control activities. These results are similar to findings from the cohort analysis[3] and provide evidence that the COMMIT intervention was delivered and received. However, the magnitudes of mean differences in individual receipt indices between the two groups of communities were small, which may be related to the limited intervention effects observed.

On the other hand, one must consider the possibility that the types of intervention used in COMMIT lack the efficacy to affect smoking behavior much beyond national secular trends. For example, analysis of receipt indices showed a lack of intervention effect on perceived public education and media coverage, a component of the intervention that could alter community norms governing tobacco use. Since COMMIT occurred during a period when there was frequent coverage of smoking issues in the media, there may have been little additional effect of the COMMIT efforts. Similarly, a measure of the unacceptability of smoking did not differ significantly between the intervention and comparison communities.

The limited impact of the COMMIT intervention on changing smoking behavior is consistent with the findings of the Stanford,[27,28] Minnesota,[29,30] and Pawtucket[31,32] community health promotion studies, although COMMIT differed from these studies in that smoking was the only behavior it targeted for intervention. The Stanford Five-City Project did report a small treatment effect on quitting behavior, which was observed regardless of baseline smoking rate and which seemed stronger for men.[28] The Minnesota Heart Health Program reported a modest beneficial intervention effect for women in their cross-sectional analysis but reported no effect for men, nor was there any intervention benefit found for either sex in their cohort sample.[30] The Pawtucket Heart Health Program failed to demonstrate a significant intervention effect for smoking in their analyses of cross-sectional surveys.[32] However, the results of these studies were based on small numbers of communities, and randomization was not used for assigning intervention.

Based on sound principles of experimental design, COMMIT allowed a rigorous evaluation of the intervention. The results from the cohort analysis,[3] combined with the cross-sectional findings presented here, lead to the conclusion that the COMMIT intervention had no effect on changing the cessation rate among heavy smokers but had a small yet significant effect on increasing the smoking cessation rate among light-to-moderate smokers. Together, these effects produced a minimal change in overall cigarette smoking prevalence, an effect that could not be statistically differentiated from zero, given the power of the cross-sectional analysis.

COMMIT has provided useful information for planning future interventions. The decreases in smoking prevalence seen in intervention as well as comparison communities are important and encouraging. That the community-based intervention did not affect heavy smokers or have a significant impact on smoking prevalence beyond the favorable secular trends is disappointing. However, COMMIT showed that light-to-moderate smokers were responsive to broad-based community approaches to smoking control, and such efforts should continue. To reach other segments of the population and to increase the overall impact of future large-scale tobacco control efforts, additional strategies not included in COMMIT should be pursued. Perhaps future tobacco-control interventions should give more attention to new clinical programs for treating nicotine addiction among heavy smokers and to public policy interventions designed to change the environment in which tobacco is used and marketed in a community.[33,34] COMMIT and most previous community-based health promotion projects have targeted adult smokers. Intervention resources might be spent productively on activities to prevent initiation of cigarette smoking and nicotine addiction among children and adolescents, as well as to promote smoking cessation among youth and adults. New approaches should be developed and rigorously evaluated in future studies. □

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